Contents

Section 9

State Water Plan, Utah Lake Basin

Water Planning and Development

With most developable water already put to beneficial use, conversions to non-agricultural uses and more intensive conservation measures will be the major focus of future water planning.

9.1. Introduction

This section describes the major past, present and proposed water planning and development activities in the Utah Lake Basin. State, federal and local agencies will be interacting with the private sector in putting Central Utah Project (CUP) water to its most beneficial uses and turning Utah Lake into a more valuable asset.

Water planning and development in Juab, Utah and Wasatch counties are progressing as the Central Utah Project moves into its final stages. The Central Utah Water Conservancy District's *Wasatch County Water Efficiency Study* is completed, and the final environmental impact statement has been reviewed. The Record of Decision was received in March, 1997. Construction of the water efficiency project is anticipated to begin in 1998.

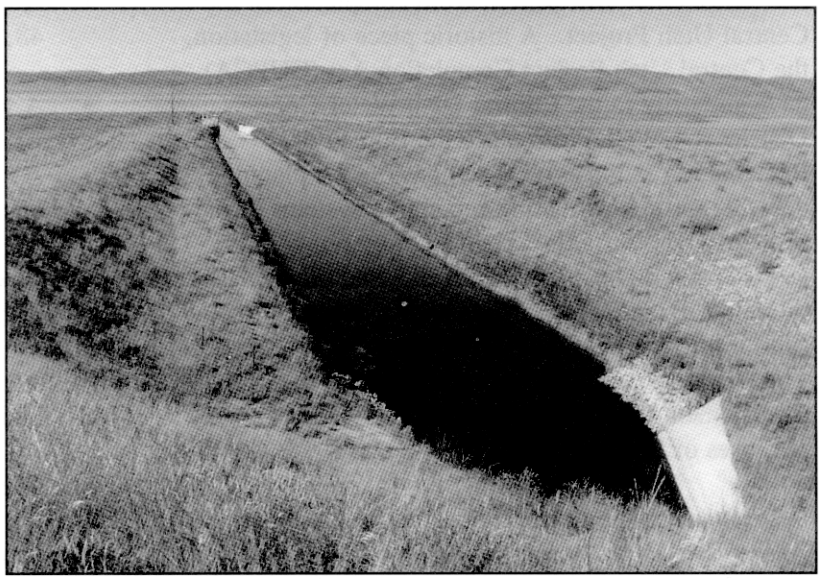
Southern Utah County and eastern Juab County are participating in the Spanish Fork Canyon/Nephi Irrigation System, pending completion of final feasibility studies and environmental reviews. Diversion, storage and conveyance facilities in Utah and Salt Lake counties are part of the district's preparation to receive additional water from Jordanelle Reservoir and other features of the CUP.

9.2 Background

Utah's history is filled with examples of public participation in water resources planning and development. Mormon pioneers received aid from church headquarters when it was needed and available. The federal government began water development activities in the early 20th century with the Strawberry Valley Project, one of its first. The Utah Water and Power Board began the present tradition of state funding in 1947. The Utah Legislature created the Board of Water Resources and Division of Water Resources in 1967 to continue providing state support.

9.2.1 Past Water Planning and Development

Major water providers have used state support sparingly. The Central Utah Water Conservancy District received funding for the Jordan Water Treatment Plant in 1972 and recently received funding for a diversion dam and storage tank. This freed up its funds for planning studies incident to the Central Utah Project Completion Act. Provo City and Orem City have never applied to the Board of Water Resources for state water funding. Both have metropolitan water districts through which they received federal water development funds. Smaller providers have been the major benefactors of state funding. Table 9-1 displays the projects funded by the Board of Water Resources.



Strawberry Aqueduct outlet to Strawberry Reservoir

A work plan for the American Fork-Dry Creek Watershed was prepared in 1958 by the Alpine Soil

Conservation District and the North Utah County Water Conservancy District; the cities of American Fork, Pleasant Grove, Lehi and Alpine; four irrigation companies and Utah County. Technical assistance was provided by several federal agencies, primarily the Soil Conservation Service. The purpose of the plan was to reduce sediment and floodwater damage to urban property, irrigation systems, farmland, recreational facilities, roads and bridges. The project also reduced water losses in canals and ditches, improved irrigation efficiency on farms, and provided additional late season irrigation water. The Santaquin Canyon Pilot Watershed Project was completed in 1955. Its primary purpose was flood control. The Miller-Bigelow Watershed Project was constructed in 1964. Located above Nephi, it provided flood protection from summer cloudburst storms which produce high, short duration flows.

9.2.2 Current Water Planning and Development

Most cities will benefit from completion of the Central Utah Project. A historic piece of legislation, the Central Utah Project Completion Act (CUPCA), gave authority to the Central Utah Water Conservancy District (CUWCD) to replace the Bureau of Reclamation as the agency responsible for planning, designing and constructing remaining systems of the project.

Section 207(b) of CUPCA directed the district to prepare a *Water Management Improvement Plan*, and submit it to the Secretary of Interior. It includes a water conservation goal and an inventory of management improvement measures. The six stated purposes of Section 207 are:

- encourage the conservation and wise use of water;
- reduce the probability and duration of periods requiring extraordinary curtailment of water use;
- achieve beneficial reductions in water use and system costs to prevent or eliminate unnecessary depletion of waters to assist in the improvement and maintenance of water quantity, quality and streamflow conditions necessary to augment water supplies and support fish, wildlife, recreation and other public benefits;
- make prudent and efficient use of currently available water before any importation of Bear River water into Salt Lake County;
- provide a systematic approach to the accomplishment of these purposes and an objective basis for measuring their achievements.

To carry out these purposes, the following activities are mandated:

- prepare a water management plan,
- undertake a water pricing policy study,
- conduct a study of coordinated operations of water management facilities,
- form a Utah Water Conservation Advisory Board.

The CUPCA also requires the water management plan include the following elements:

- A water conservation goal. The district's goal is 48,389 acre-feet per year.
- A water management improvement inventory.
- A comparative analysis of each cost-effective and environmentally acceptable measure.
- A schedule of implementation for the following five years.
- An assessment of the performance of previously implemented conservation measures.

The Diamond Fork System, a component of the Bonneville Unit of the CUP, is expected to be completed under the CUPCA. Its purpose is to transport water from the enlarged Strawberry Reservoir in the Uinta Basin to the confluence of the Diamond Fork and Spanish Fork rivers. This water will be available for municipal, industrial and agricultural uses. Besides water supply benefits, the project will also provide recreation, fish and wildlife measures and water quality control. Physical features of this system include the Syar Tunnel, Sixth Water Aqueduct, Tanner Ridge Tunnel, Diamond Fork Siphon, Red Mountain Tunnel, Red Hollow Pipeline and the Diamond Fork Pipeline.

The Diamond Fork Pipeline was completed in the fall of 1997. The other features of this system are in the final planning stage and will not be built until the

Table 9-1

BOARD OF WATER RESOURCES PROJECTS

Sponsor	Type	
JUAB COUNTY		
Eureka City	CL-WELL	Feb-82
Mona Irrigation Co	IR-WELL	Apr-62
Mona Irrigation Co	LH-PIPE	Jan-84
Mona Town	CL-TANK	Nov-83
Nephi Irrigation Company	DAM-REP	Jul-49
Nephi Irrigation Company	IR-WELL	May-54
Nephi Irrigation Company	IR-WELL	Apr-60
Nephi Irrigation Company	IR-WELL	Jul-63
Nephi Irrigation Company	IR-WELL	Jun-66
Nephi Irrigation Company	CNL-LNG	May-68
Nephi Irrigation Company	DUAL-WS	Dec-83
North Canyon Irrigation Co	PR-PIPE	May-74
JUAB COUNTY TOTAL 12		
SUMMIT COUNTY		
Francis Town	CL-TANK	Aug-79
Woodland Mutual Water Co	CL-SYST	Apr-75
Woodland Mutual Water Co	CL-WELL	Jan-95
SUMMIT COUNTY TOTAL 3		
UTAH COUNTY		
Alpine Irrigation Company	DIV-DAM	Oct-59
Alta Ditch & Canal Co	PR-PIPE	Aug-56
American Fork Irrigation Co	CNL-LNG	Nov-60
American Fork Irrigation Co	IR-WELL	Sep-70
American Fork Irrigation Co	PR-PIPE	Mar-82
American Fork Irrigation Co	LH-PIPE	Mar-92
Alp Irrigation Assn/No Utah County WCD	DAM-RES	Feb-67
Cedar Fort Irrigation Co	IR-WELL	May-73
Cedar Fort Irrigation Co	PR-PIPE	Aug-78
Cedar Fort Irrigation Co	REG-PON	Jan-84
Central Utah WCD	DIV-DAM	Oct-94
Covered Bridge Canyon POA	CL-SYST	Sep-87
Currant Creek Irrigation Co	IR-WELL	May-54
East Santaquin Irrigation Co	IR-WELL	May-60
East Warm Creek Irrigation Co	CNL-LNG	Oct-60
Elberta Water Company	CL-WELL	Dec-76
Elberta Water Company	CL-TANK	Mar-89
Eldon Money	STOCKWR	Apr-78
Elk Ridge Town	CL-TANK	Aug-83
Fairfield Irrigation Co	CNL-LNG	Aug-61
Fort Field Water Users Assn	PR-PIPE	Aug-61
Genola Town Goshen Irrigation & Canal Co	CL-TANK	Nov-81
Goshen Irrigation & Canal Co	CNL-LNG	Jan-66
Goshen Irrigation & Canal Co	DAM-REP	Apr-82

UTAH COUNTY (continued)		
Goshen Irrigation & Canal Co	LH-PIPE	Dec-87
Goshen Town	CL-PIPE	Apr-84
Highland Water Company	CL-SYST	Oct-58
Highland City	DUAL WS	Jul-96
Lake Bottom Irrigation Co	CNL-LNG	May-57
Lake Bottom Irrigation Co	LH-PIPE	Nov-92
Lakeside Irrigation Company	DIV-DAM	Dec-90
Lehi City	DUAL-WS	May-89
Lehi Irrigation Company	IR-WELL	Jul-56
Lehi Irrigation Company	CNL-LNG	May-60
Lehi Irrigation Company	CNL-LNG	Apr-62
Lehi Irrigation Company	LH-PIPE	Apr-95
Lehi-New Survey Well Co	IR-WELL	Jun-61
Lindon City	CL-PUMP	Aug-80
Lindon City	DUAL-WS	Jul-92
Lindon City	CL-TANK	Aug-94
Mapleton Irrigation Co	CNL-LNG	Feb-61
Matson Springs Irrigation Co	IR-WELL	Oct-61
Mt Loafer Irrigation Co	IR-WELL	May-61
North Fork Special Service District	CL-TANK	Oct-80
North Union Irrigation Co	CNL-LNG	Jun-59
North Union Irrigation Co	CNL-LNG	Dec-87
Olsen Brothers Irrigation Co	IR-WELL	Nov-61
Orem Fruit Growers Water Corp	IR-WELL	Aug-61
Payson City	DAM-REP	Apr-87
Payson City	DUAL-WS	Mar-91
Payson City	CL-PIPE	Aug-95
Pleasant Grove Irrigation Co	PR-PIPE	Apr-51
Pleasant Grove Irrigation Co	IR-WELL	Jun-55
Pleasant Grove Irrigation Co	CNL-LNG	Apr-60
Salem City	CL-TANK	May-78
Salem City	CL-TANK	Aug-86
Salem Irrigation & Canal Company	CNL-LNG	Oct-75
Salem Irrigation & Canal Company	CNL-LNG	Jun-85
Santaquin City	CL-PIPE	Sep-91
Salem Pond Company	CNL-LNG	Jul-59
Santaquin City	CL-SYST	Oct-84
Smith Ditch Company	PR-PIPE	Jul-61
Spanish Fork South Irrigation Co	CNL-LNG	Oct-60
Spanish Fork South Irrigation Co	CNL-LNG	Oct-61
Spanish Fork South Irrigation Co	CNL-LNG	Apr-66
Spanish Fork South Irrigation Co	CNL-LNG	Apr-76
Spanish Fork South Irrigation Co	CNL-LNG	Apr-83
Spanish Fork Southeast Irrigation Co	IR-WELL	Aug-70
Spring Lake Water Company	CL-SYST	Jun-76
Spring Lake Waterworks Co	CL-TANK	Oct-89
Summit Creek Irrigation & Canal Co	DAM-RES	Sep-48
Summit Creek Irrigation & Canal Co	DAM-REP	Jan-59
Summit Creek Irrigation & Canal Co	IR-WELL	Feb-61
Summit Creek Irrigation & Canal Co	IR-WELL	May-70
Summit Creek Irrigation & Canal Co	PR-PIPE	Dec-70
Summit Creek Irrigation & Canal Co	PR-PIPE	Oct-72
Summit Creek Irrigation & Canal Co	PR-PIPE	Dec-85
Utah Lake Distributing Co	LH-PIPE	May-84
West Union Canal Company	CNL-LNG	Dec-53
West Union Canal Company	IR-WELL	Jun-61
Woodland Hills Town	CL-PIPE	Dec-83
UTAH COUNTY TOTAL 81		

WASATCH COUNTY		
Center Creek Irrigation Co	DAM-REP	Aug-73
Center Creek Irrigation Co	SPRINKL	May-85
Center Creek Water System	CL-SYST	Oct-68
Charleston WCD	CL-SYST	Jun-49
Charleston WCD	CL-TANK	Apr-83
Daniel Domestic Water Co	CL-SYST	Oct-67
Daniel Domestic Water Co	CL-PIPE	Apr-72
Daniel Domestic Water Co	CL-PIPE	May-87
Daniel Irrigation Company	DIV-DAM	Jun-53
Daniel Irrigation Company	DIV-DAM	Oct-68
Daniel Irrigation Company	SPRINKL	Oct-77
Extension Irrigation Co	CNL-LNG	Nov-58
Jones Reservoir & Irrigation Co	DAM-ENL	Oct-56
Lake Creek Irrigation Co	CNL-LNG	Sep-57
Lake Creek Irrigation Co	LH-PIPE	Jun-66
Lake Creek Irrigation Co	LH-PIPE	Dec-67
Lake Creek Irrigation Co	LH-PIPE	Sep-72
Lake Creek Irrigation Co	DAM-REP	Oct-80
Lake Creek Irrigation Co	PR-PIPE	Apr-83
Lake Creek Irrigation Co	SPRINKL	Aug-85
Lake Creek Irrigation Co	DAM-REP	Nov-88
Lake Creek Irrigation Co	PR-PIPE	Jun-92
Oak Haven Water Users Assoc	CL-TANK	Jul-93
Twin Creeks SSD	CL-SYST	Feb-95
WASATCH COUNTY TOTAL 24		
GRAND TOTAL 121		

CODE DESCRIPTION

CL-CLOR	Culinary Chlorinator
CL-PIPE	" Pipe
CL-PUMP	" Pump
CL-SPRI	" Spring
CL-SYST	" New System
CL-TANK	" Storage Tank
CL-TRMT	" Treatment Plant
CL-WELL	" Well
Canal	Canal
CNL-ENL	Canal Enlargement
CNL-LNG	Canal Lining
CNL-REP	Canal Repair
DAM-ENL	Dam Enlargement
DAM-REP	Dam Repair
DAM-RES	Dam & Reservoir (New)
DIV-DAM	Diversion Dam
DUAL-WS	Lawn & Garden Irrigation
EQ-WELL	Equip. Well - Irrigation
IR-PUMP	Irrigation Pump
IR-WELL	Irrigation Well
LH-PIPE	Low Head Pipe
MISCELL	Miscellaneous
PR-PIPE	Pressure - Pipe Irrigation
REG-PON	Regulating Pond - Irrigation
SPRINRL	Sprinkle Irrigation System
STOCKWR	Stockwater Facilities
TUNNEL	Tunnel
TUN-ENL	Tunnel Enlargement
TUN-REP	Tunnel Repair

environmental review is completed for the SFN System and a record of decision insured by the Secretary of the Interior. This is expected late in 1998.

The CUPCA, Section 202(a)(2-5) mandates the following special studies to identify ways to use water more efficiently:

- A conjunctive use of surface water and groundwater which will allow for groundwater recharge and management,

- A feasibility study to determine efficiency improvements in the management, delivery and treatment of water in Wasatch County to provide for the construction of the Wasatch County Water Efficiency Project,

- A Utah Lake salinity study to determine the feasibility of reducing salinity in Utah Lake,

- A hydrologic study of the Provo River Basin that includes a hydrologic model of the river system. Also, a feasibility study of the direct delivery of Colorado River Basin water from the Strawberry Reservoir or elsewhere in the Strawberry Collection System to the Provo River Basin.

The objectives of these studies are to determine ways to more efficiently use agricultural, municipal and industrial water; restore and improve wetlands; maintain groundwater recharge and maintain or enhance other environmental resources.

The Daniels Replacement Project requires the district to replace water currently diverted from the Strawberry River drainage to the Daniels Creek Irrigation Company in Heber Valley. This replacement is necessary because of the completion act's requirement that flows in the upper Strawberry River be restored, and that the Daniels Creek diversion be terminated. The irrigation water flowing to the Daniels Creek Irrigation Company must be replaced with water at least equal in quality and reliability to that historically received through transbasin diversion. The plan will deliver replacement water from Jordanelle Reservoir. An alternative source for replacing Strawberry water is pumping from groundwater in the Daniels area. This would require test pumping to prove that groundwater is available.

The Spanish Fork Canyon/Nephi Irrigation System (SFN) will provide supplemental irrigation and M&I water by a transbasin diversion from Strawberry Reservoir to southern Utah County and eastern Juab County. The main conveyance system is a gravity pipeline extending from the mouth of Diamond Fork River to the Nephi area.

Preliminary studies show that an annual water supply of about 79,600 acre-feet will be available for delivery through this system. Of this amount 11,200 acre-feet is for M&I use and the balance is for irrigation purposes. This does not include return flows or the 21,300 acre-feet used for instream flows and exchange to Jordanelle Reservoir. Central Utah Project water will be used to meet crop deficiencies which occur during mid to late season, particularly during dry years. It will also be used to provide a full supply to some new lands in eastern Juab County. The amount of CUP water would vary from year to year with little or no water being imported during wet years and large amounts during dry years. Construction of the SFN System is expected to begin in 1999. System completion is scheduled for the year 2007.

Water conservation measures that could be developed within the SFN System service area include, but are not limited to:

- lining existing canals,
- on-farm irrigation improvements,
- conjunctive use of surface and groundwater.

The CUPCA also requires a study to improve coordination between all water systems in the district's area. It looked at individual and interagency conservation programs and coordinating projects. Objectives of the study are to:

- improve the availability and reliability of the water supply;

- coordinate the timing of reservoir releases under existing water rights to improve instream flows for fisheries, wildlife, recreation and other environmental values, if possible;

- assist in managing drought emergencies by making more efficient use of facilities;

- encourage the maintenance of existing wells and other facilities which may be placed on standby status when water deliveries from the project become available;

- allow for the development, protection and sustainable use of groundwater resources within the district's boundaries;

- not reduce the benefits that would be generated in the absence of the joint operating procedures;

- integrate management of surface and groundwater supplies and storage capability.

The district has helped develop technical models of the CUP and related features that show water users can benefit from coordinated operations. Possibilities for coordination will be integrated into the engineering phase of the SFN System. The district has developed an operations model of the Provo River system, called PROSIM, which was also used as part of the *Wasatch County Water Efficiency Study*. This model aids the district in simulating different operating conditions of the Provo River system including Jordanelle and Deer Creek reservoirs. The district is also developing a "water balance" model of the Uinta Basin as part of the Uinta Basin Replacement Project. This is not in the Utah Lake Basin, but it will affect this area. The CUPCA activities that deal strictly with conservation issues are explained in Section 17.

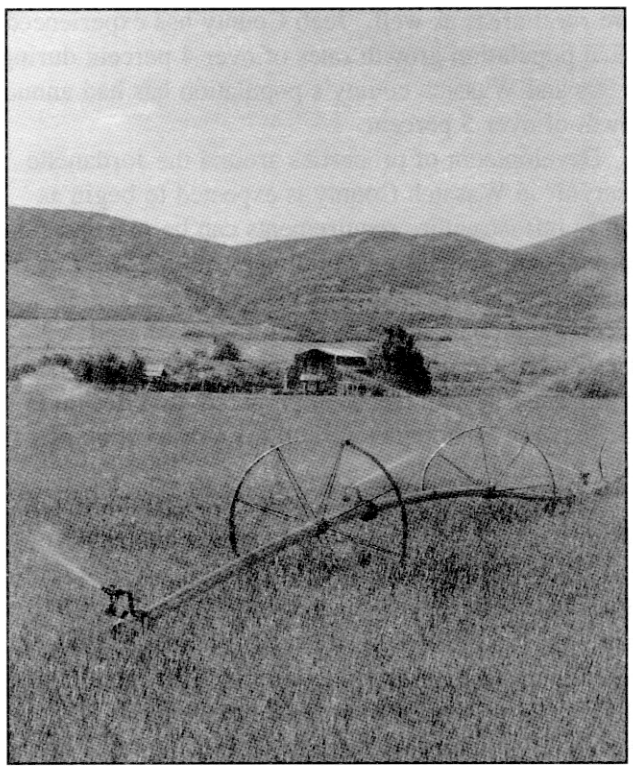
In Wasatch County, a watershed work plan has been prepared for Heber Valley as part of the Tri-Valley Watershed Project. The first priority will be on-farm practices, sprinkler irrigation systems, etc. This program assists local entities in planning and constructing improvements to reduce erosion and prevent flood water and sediment damages in their watersheds.

9.2.3 Environmental Considerations

Section 301 of the Central Utah Project Completion Act establishes the Utah Reclamation Mitigation and Conservation Commission to coordinate the implementation of mitigation and conservation provisions. In addition, the commission is to administer the expenditure of funds for the implementation of the fish, wildlife and recreation mitigation and conservation projects and features authorized in the act. Projects receiving federal funds from the Water Management Improvement Program (Section 207 in CUPCA) must satisfy requirements of the National Environmental Policy Act (NEPA).

9.3 Water Resources Problems

Water resources in parts of the basin are in transition from irrigated agriculture to urban uses. When comparing the present total basin water use with total supply, there appears to be adequate water beyond the year 2020. However, there are several problems in specific communities. Rapid urban growth in northern and southern Utah County, and the closure of this basin to further appropriation, has sent water prices upward by 1,000 percent or more over 10 years. Local cities require water rights and/or shares of irrigation stock be turned over when adjacent land is annexed. This has created a seller's market where it is profitable to hold water rights in anticipation of a larger payoff down the road.



Sprinkler irrigated land near Nephi

Another problem lies in the cost of time and uncertainty necessitated by current water rights change application protocol. Since most changes in the place and nature of use of water requires official application notices, waiting periods, expensive legal assistance (in some cases) and engineering consultation, transaction costs may be high and the outcome uncertain. Legislative action is required to change protocol.

A Utah Supreme Court case (East Jordan Irrigation Company vs. Payson City) overturned the State

Engineer's decision to allow a stockholder to submit a change application for its water shares without approval of the company board of directors. This decision placed more power in the hands of irrigation company officials to control the movement of water yielded from a company's water right. A slowing of the transfer of the resource to different uses or locations that command higher prices in the market could result.

In addition, commercial farmers who hold existing water rights are content to continue with the present use. They are located close to their markets and enjoy the farm and ranch lifestyle. They anticipate ever-increasing prices for their land and water to ensure a secure retirement for them and an endowment for their children. Problems associated with transferring water from agricultural to urban uses are occurring in the more rural areas as well. Juab County has experienced annual population growth rates of over 4 percent during the 90s and Wasatch county's population has had annual growth of over 5 percent.

Development of properties around the Jordanelle Reservoir in Wasatch County is expected to begin as soon as infrastructure requirements can be met and final approvals are granted for building permits. The rate of development is expected to be driven by market demands and constrained by the limits of phased infrastructure design and construction. A master plan for the water system has been prepared, and design is anticipated to be completed soon for construction of initial facilities.

The Jordanelle Special Service District (JSSD) currently includes land west and north of the reservoir. Developers have plans to develop their properties with 5,124 equivalent residential units (ERUs). One ERU corresponds to an average residential home. Other developments (hotels, commercial facilities, etc.) are individually rated at a determined number of ERU's based on the anticipated water/waste water flow rates.

Development of properties served by the JSSD is expected to begin in 1998 with projected construction rates of approximately 275 ERUs per year through 2003. Following these initial years of fast-paced construction, development is projected to slow to approximately 125 ERUs per year.

Development of additional properties east and south of the reservoir will be based on similar constraints, but the number of planned ERU's has not been finalized. Water to meet demands of the real estate development around Jordanelle Reservoir may come from the reservoir and/or Ontario Tunnel.

Closely associated with this urban growth is the need to expand the water infrastructure. The Central Utah Project Completion Act (CUPCA) authorizes a significant amount of federal funds to bring more water into the basin through the SFN System, and encourage conservation. Funding must be found for the local share of the project cost. Funding the non-project cost of pipelines and other facilities to get project water to its end user is an additional challenge.

9.4 Water Use and Projected Demands

Water uses and projected demand for culinary (M&I), secondary, agricultural, recreational and environmental needs are discussed.

9.4.1 Culinary Water (M&I)

The Wasatch Front Water Demand/Supply Computer Model (WFCM) was used to predict the future water needs of the major water suppliers in Utah County. Based on the existing use patterns and the population growth projections provided by the Governor's Office of Planning and Budget (See Section 4), the WFCM was used to project future water use needs at five year intervals from 1995 to 2020. The following assumptions, used with the WFCM, are central to the conclusion for Utah County.

- The slower increase in municipal water demand relative to population increase results from assumed construction of secondary water systems in several Utah county cities (Alpine, Lehi, Highland, Lindon, Payson and Salem). It is believed these systems will begin to operate between 2000 and 2010. The water supply for the secondary system is assumed to come from the conversion of agricultural water. All other Utah County cities except Woodland Hills and Elk Ridge have secondary irrigation systems, but water is delivered in open ditches.

- Current developed supplies will continue to be available.

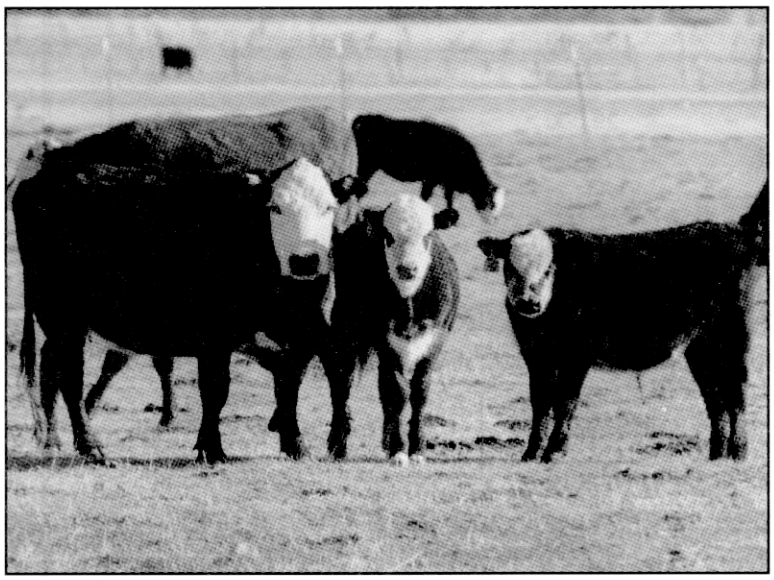
- The State Engineer's *Utah/Goshen Valley Groundwater Management Plan* (See Section 19) estimates an additional 169,000 acre-feet of groundwater could be developed in Utah County by exchange for surface water rights and /or Utah Lake water rights. Opposition from downstream water right holders has been expressed. Part of the

169,000 acre-feet will be developed for use in Salt Lake County. It has been estimated that approximately 75,000 acre-feet of additional groundwater will be developed from present and new wells for M&I uses in Utah County.

- The Central Utah Project will be completed and deliver 31,200 acre-feet of municipal water to communities in Utah County.

Table 9-2 compares the projected M&I water demands of major water suppliers in Utah County with the projected M&I water supplies. Smaller systems are not included. Utah County has sufficient water supplies to meet anticipated demands well beyond the year 2020. The 20,000 acre-feet of M&I water for north Utah County can be delivered now. This water comes from the M&I system, and it would require an exchange out of Strawberry Reservoir.

The water use data for the other counties (Juab, Summit, and Wasatch) that are part of the basin were obtained from meetings with all of the community water system managers. This data is summarized in the Division of Water Resources' *M&I Water Supply, Use and Rights in the Upper Jordan River Basin.* Table 9-3 summarizes culinary M&I water use and projects water demand.



The ranch lifestyle is still cherished in the basin

9.4.2 Secondary Water

Thirty-two basin communities have secondary systems for delivering water to lawns, gardens and other landscaping. Water use in these systems is presented in Table 9-4. Secondary use is projected as a percentage of culinary use. New secondary water systems will likely be installed as more communities approach the limits of their culinary water supplies.

9.4.3 Agricultural Irrigation Water

Approximately 166,400 acres of land are irrigated in the Utah Lake Basin. This may use 453,700 acre-feet of water for crop production. Table 9-5 shows the projected needs. Section 10 provides additional detail on agricultural water use.

9.4.4 Recreational Demands

Some of the state's most popular water-based recreation is located in this basin. The new Jordanelle Reservoir, Deer Creek Reservoir, and Utah Lake provide about 102,000 acres of reservoir recreation opportunities. Crowding has been a problem at Deer Creek Reservoir for many years. Jordanelle State Park was fully reserved for weekend use for the season before it officially opened on July 1, 1995. Recreational demand for water is expected to be very strong. More detail is provided in Section 15.

9.4.5 Environmental Needs

Water is needed for riparian vegetation, wetland maintenance and instream flows for fish and wildlife. Phreatophytes, deep rooted plants that obtain water from the water table or the soil just above, occupy approximately 2.6 percent of the basin. Many of the phreatophyte areas, such as Provo Bay at Utah Lake, are considered valuable for wildlife. They also act as natural filters, removing some nutrients and other pollutants from the waters which flow through them.

The Central Utah Project Completion Act (303)(b)(4)(c) requires operating plans for the Bonneville Unit of the Central Utah Project be established or adjusted to provide minimum streamflows discussed in Subsection 5.4.5.

Since the passage of the Endangered Species Act (ESA) in 1973, four Colorado River fishes have been listed as endangered. These are the Colorado squawfish, humpback chub, bonytail chub, and the razorback sucker. All of these fish have or do inhabit areas of the Green River and some have or do inhabit areas of the lower Duchesne River.

Table 9-2
UTAH COUNTY PROJECTED M&I DEMAND & SUPPLY FOR MAJOR SUPPLIERS

Year	1995 Population Projection	Water Demand (acre-feet)	Water Supply (acre-feet)	Surplus(+) Deficit(-)
1995	292,700	107,500	190,000	+ 82,500
2000	329,900	120,100	190,000	+ 69,900
2010	426,000	151,800	190,000	+ 38,200
2020	512,400	183,000	190,000	+ 7,000

Source: Wasatch Front Water Demand/Supply Model, February, 1997.

Table 9-3
1995 CULINARY WATER USE AND PROJECTED DEMAND[a]

Year	Juab	Summit	County Utah (acre-feet)	Wasatch	Total Diversion
1995					
Residential	870	300	83,400	2,240	868,890
Commercial/Institutional	460	10	25,790	500	26,760
Industrial	640	0	27,000	60	27,700
Total	1,970	390	136,190	2,800	141,350
2000					
Residential	930	430	92,300	2,530	96,190
Commercial/Institutional	490	10	27,700	570	28,770
Industrial	680	0	29,000	70	29,750
Total	2,100	440	149,000	3,170	154,710
2010					
Residential	1,070	500	109,830	3,050	114,470
Commercial/Institutional	560	10	32,600	680	33,850
Industrial	790	0	35,500	80	36,370
Total	2,420	510	177,950	3,810	184,690
2020					
Residential	1,230	590	125,900	3,480	131,200
Commercial/Institutional	650	10	38,870	780	40,310
Industrial	900	0	39,940	90	40,930
Total	2,780	600	204,710	4,350	212,440

a Includes Public Systems, Private Domestic and Self-Supplied Industries.

Table 9-4

1995 SECONDARY RESIDENTIAL WATER USE AND PROJECTED DEMAND

Year	County Juab	Summit	Utah	Total Wasatch	Diversion
			(acre-feet)		
1995	550	0	3,200	1,350	5,100
2000	660	0	3,600	1,530	5,690
2010	680	0	4,100	1,850	6,630
2020	780	0	4,500	2,100	7,380

Table 9-5

IRRIGATION WATER USE AND PROJECTED DEMAND

Year	Juab	Sanpete	Summit	Utah	Wasatch	Total Diversion
			(acre-feet)			
1988	42,000	9,100	7,400	333,200	62,000	453,700
1995	42,100	9,100	7,400	332,100	63,000	453,700
2000	42,100	9,100	7,200	325,400	62,700	446,500
2010	84,600[a]	9,100	7,100	334,800[a]	62,100	497,700
2020	84,300	9,100	6,900	324,900	61,800	487,000

[a] Assumes SFN project completion by 2010.

A Recovery Implementation Program (RIP) for the Endangered Fish Species in the upper Colorado River Basin was developed in 1987 cooperatively by the Secretary of Interior; the Governors of Wyoming, Colorado and Utah; and the Administrator of the Western Area Power Administration. The objective of the RIP was to provide a way to recover the four endangered fish and at the same time allow for the continued development of water by the upper basin states. The RIP is intended to provide the reasonable and prudent alternative (RPA) for projects undergoing Section 7 consultation in the upper basin. Section 7(a)(2) of the Endangered Species Act applies to federal agencies and requires them to insure that activities they authorize, fund or accomplish are not likely to destroy or adversely modify critical habitat. To identify the specific actions needed, the *Recovery Action Plan* (RAP) was developed. The RAP identifies those actions believed necessary to recovery of the fish. The RIP serves as the RPA. The RAP must be adaptive because new information, changing priorities and the development of the states' water entitlement requires modifications to the RAP. The RAP is reviewed and updated annually. The *Recovery Action Plan* is referred to as RIPRAP in program documents and correspondence.

The RIP requires consensus among the Implementation and Management Committees and Technical Committees. Issues are significant and often controversial. One difficult issue the RIP is addressing is the fundamental definition of "recovery." This has made defining objectives difficult. In spite of the difficulties, the RIP has facilitated water development in the Upper Basin and keeps all interested parties working together.

A 1980 biological opinion (amended in 1990) identified modifying operation of Flaming Gorge as the RPA for the completion of the Strawberry Aqueduct and Collection System. Coincident with the issuance of this biological opinion, Section 7 consultation began on the

continued operation of the Flaming Gorge Dam. After completion of the Strawberry opinion, the Fish and Wildlife Service (FWS) determined that insufficient data existed on flow requirements of the endangered fish, and that a biological opinion on the continued operation of Flaming Gorge Dam should not be issued until further studies were conducted. Between 1980 and 1991, a series of agreements delayed the issuance of a biological opinion. The FWS issued a biological opinion in 1992 which, among other things, called for a five-year research program to determine flow requirements. The final biological opinion on the operation of Flaming Gorge Dam is scheduled to be issued in December 1997. It may also address how operating Flaming Gorge Dam may impact development on the Duchesne River, and thus the diversion of water from the Duchesne River Drainage to the Utah Lake Basin. The razorback sucker was listed as endangered in 1991, and the lower 2.5 miles of the Duchesne River was designated as critical habitat in 1994. These actions resulted in the reinitiation of Section 7 consultation on the Bonneville Unit. A new action item was added to the RAP and funded by the RIP to do a three- to five-year study to determine flow requirements on the Duchesne River. The FWS issued a preliminary draft biological opinion in 1997 on the depletion effects on the Colorado River endangered fishes, and their critical habitats, in the Duchesne River Basin. This opinion should be completed in early 1998. It could affect the diversion of water for the Bonneville Unit.

One of the RAP activities recently completed was the *Duchesne River Hydrology and Water Availability Study*. The objectives of the study were to quantify the amount of water currently in the lower Duchesne River, compare this with the preliminary recommended flows determined by the Fish and Wildlife Service, and identify potential sources of water that could be used to augment flows in the lower Duchesne. The study concludes that there is a significant difference between existing flows in the lower Duchesne River and the preliminary recommended flows. Some potential sources of water are listed, but they are well short of the preliminary recommended flows.

Other action plans for the Duchesne River have yet to be written. Once written, it will be the responsibility of the RIP to implement the RPAs. Once the biological needs have been identified and evaluated, plans will be devised by the RIP to provide conditions for recovery of the endangered fish.

The service is writing a new biological opinion for the lower Provo River that will list new RPAs to protect the endangered June sucker and associated 4.9 miles of critical habitat. Unlike the Duchesne, there is no recovery program on the Provo River. Completion of the RPAs will be the responsibility of the project proponents and the Bureau of Reclamation.

Existing RPAs on the Provo River include: 1) Identify, store, deliver, and protect water necessary for minimum annual flushing, spawning and nursery flows in the Provo River. Studies will be conducted for a Three-year period to refine these flow recommendations; 2) ensure that storage flexibility in Deer Creek Reservoir occurs to assist with flow requests during June sucker spawning; 3) install a water quality monitoring system and use the system to maintain adequate riverine water quality during June sucker residence in the Provo River; and 4) ensure full discussion and action for June sucker flow and habitat needs through the interagency/interdisciplinary Provo River Resource Team.

Studies are required and funded by the CUPCA to identify mitigation and conservation opportunities. Specifically, effects of peak flows in the Provo River on fisheries and recreational use, along with mitigation and conservation opportunities possible through habitat or stream bed modification, will be investigated. Opportunities associated with water acquisitions and other aspects of the CUPCA will also be studied.

9.4.6 Water Use and Projected Demand Summary

In general the demand for M&I water parallels population growth. Although population growth may require more water than is presently developed, conversion of agricultural water to M&I use will offset the deficit. This trend is expected to continue into the long-term future. The overall projected water demands are summarized by use category in Table 9-6.

9.5 Alternatives for Meeting Water Needs

Nearly all water sources in the Utah Lake Basin will be developed if the Central Utah Project is completed in its entirety. Numerous opportunities have been identified by district consultants in a study on ways to coordinate operation of planned and present facilities and systems. Engineering and cost analyses have not been done for most of them as of this writing. Implementing the feasible opportunities will provide maximum benefit from the use of the scarce water supply.

Table 9-6
SUMMARY OF CURRENT WATER USE AND PROJECTED DIVERSIONS AND DEPLETIONS

Use	Year 1995 Diversion	1995 Depletion	2020 Diversion	2020 Depletion	2050 Diversion	2050 Depletion
	(acre-feet)					
Municipal & Industrial	150,700	60,830	226,620	96,020	386,000	169,640
Culinary	141,345	55,100	212,440	87,080	368,000	158,240
Secondary	9,340	5,730	14,180	8,940	18,000	11,700
Irrigation	453,700	253,660	487,000	282,460	395,000	237,000
Wet/Open Water Areas[1]	16,700	16,700	16,700	16,700	16,700	16,700
Net Evaporation (Major Reservoirs)	240,000	240,000	240,000	240,000	240,000	240,000
Basin Total	861,100	571,190	970,320	635,180	1,037,700	663,000

[1] No water diverted to these areas. Diversions = Depletions

9.5.1 Water Supply Management

Several opportunities were identified by the CUPCA mandated study of coordinating operations (Section 207(d))to improve management of existing supplies. Contractual arrangements between municipalities and local farmers can be structured to transfer irrigation water to cities during serious drought periods. This would provide municipalities with supplemental water when needed most without having to carry excess water rights that may be rarely needed. Irrigators would be compensated for any profit lost by the arrangement, and participation would be voluntary. Irrigation water used for raising alfalfa, small grains and pasture would more likely be made available than water used to produce orchard or other specialty crops. An approved water right change application would be required.

Construction of small surface water treatment plants at strategic locations could offer the ability to use currently untreatable surface water supplies. These plants could treat winter season flows not currently used for public supply. Treated water could be used directly for groundwater injection. Multiple small facilities could make conjunctive use on smaller mountain streams practical without lengthy collection systems. Two promising locations for new surface water treatment plants are American Fork and Spanish Fork rivers. The American Fork River location could use supplemental supplies from the Jordan or Alpine Aqueduct or even the Salt Lake Aqueduct. The Spanish Fork River plant could use stored supplies from Strawberry Reservoir through the Syar Tunnel and associated facilities. Conjunctive use can also be carried out by exchanging surface supplies with wells.

A wastewater total containment lagoon at Nephi utilizes evaporation. It may be possible to use this water for land application, i.e., growing selected crops or supplementing downstream supplies with treated effluent. This is a small facility and would require additional treatment to allow discharge. Advanced treatment to limit phosphorus and nitrate discharges would likely be required. With proper blending and treatment, it may be possible to utilize certain other low quality water sources such as Utah Lake for municipal use. Advanced treatment would probably be required to eliminate TDS and odor concerns. Effluent from all wastewater treatment facilities is being reused, directly or indirectly, mostly for agricultural. All of the above options would present water rights issues that need to be addressed.

Three reaches of the Alpine Aqueduct have been constructed. Reach 1 delivers water from the Provo River in the Olmsted flowline to the Utah Valley Water Treatment Plant (UVWTP), and is the upstream section of the Jordan Aqueduct Reach 4. Alpine Aqueduct Reach 2 delivers treated water from the UVWTP to

Orem and Provo cities. Alpine Aqueduct Reach 3 is constructed, but it has not been put into operation. The original plan was to deliver treated water from the UVWTP to northern Utah County. As an alternative, if a bypass around the treatment plant were to be constructed, this aqueduct could be used to supply raw water to secondary systems in north Utah County, reducing the demand for culinary water. Figure 9-1 shows the major aqueducts.

9.5.2 Surface Water Storage Facilities.

When the Central Utah Project is completed, most feasible surface storage sites will be developed. Upstream storage capacity is increasing the flexibility in the system. Keeping as much water as possible in the upper reservoirs allows these supplies to be released on an "as called for" basis to a broader service area. Lower reservoirs can be used to provide supplemental capacity. Demands would be met from the lowest possible source, maximizing the flexibility. An added benefit may be reduced system-wide evaporation losses since upstream reservoirs are located where there are lower temperatures. These reservoirs are generally deeper and have higher retention efficiencies. Utah Lake, by comparison, is very inefficient due to its broad surface area, shallow depth and low elevation. More aggressive operation of reservoirs using real time data and better modeling of storage systems may increase usable surface water supplies. In some areas, multiple upstream reservoirs feed lower downstream rights. Downstream water demands are met more efficiently when the multiple reservoirs are operated as a single system to fulfill the downstream rights rather than relying on the specific water rights.

Operation of the multiple reservoirs as a single system improves flexibility. A current example is the Deer Creek/Jordanelle Operating Agreement which went into effect November 1, 1994, and governs the operation of the two reservoirs.

The current system of water rights continues to be a determinant in river system operation. To operate outside the current water right priority system is not possible without impacting holders of water rights. The above concept also conflicts with long-term storage of CUP water in facilities specifically built for supplemental deliveries in drought years.

Diking Goshen Bay and/or Provo Bay in Utah Lake has been studied and rejected by the Bureau of Reclamation and not recommended by the state in its 1989 review of the CUP. Several development schemes have been put forward for highway causeways and man-made peninsulas for real estate development. Alternative development scenarios that result in reducing the lake surface area and increasing its depth would reduce evaporation and may improve water quality. However, modifications would be expected to have significant impacts on fish and wildlife populations.

In the 1930s, the Bureau of Reclamation and the State of Utah investigated possible reservoir sites on Salt Creek above Nephi. One site, Blacks Narrow, was given considerable attention. The investigations were discontinued when it was determined that the Salt/Currant Creek system was fully appropriated. With the construction of the Spanish Fork Canyon-Nephi Irrigation System and the importation of water into Juab Valley, the question of water rights could likely be overcome by exchanges. During a scoping meeting at Nephi in 1984 for the Irrigation and Drainage (I&D) System (replaced by the Spanish Fork Canyon/Nephi Irrigation System), renewed interest was expressed for a dam and reservoir on Salt Creek. Possible benefits for constructing the reservoir at Blacks Narrow include recreation, improved water quality during spring runoff, delivery of a supplemental irrigation supply to the Nephi area, and flood control. In addition, Mona Pumping Plant and irrigation peaking features of the SFN system could be downsized, thus reducing their construction, operating and maintenance costs.

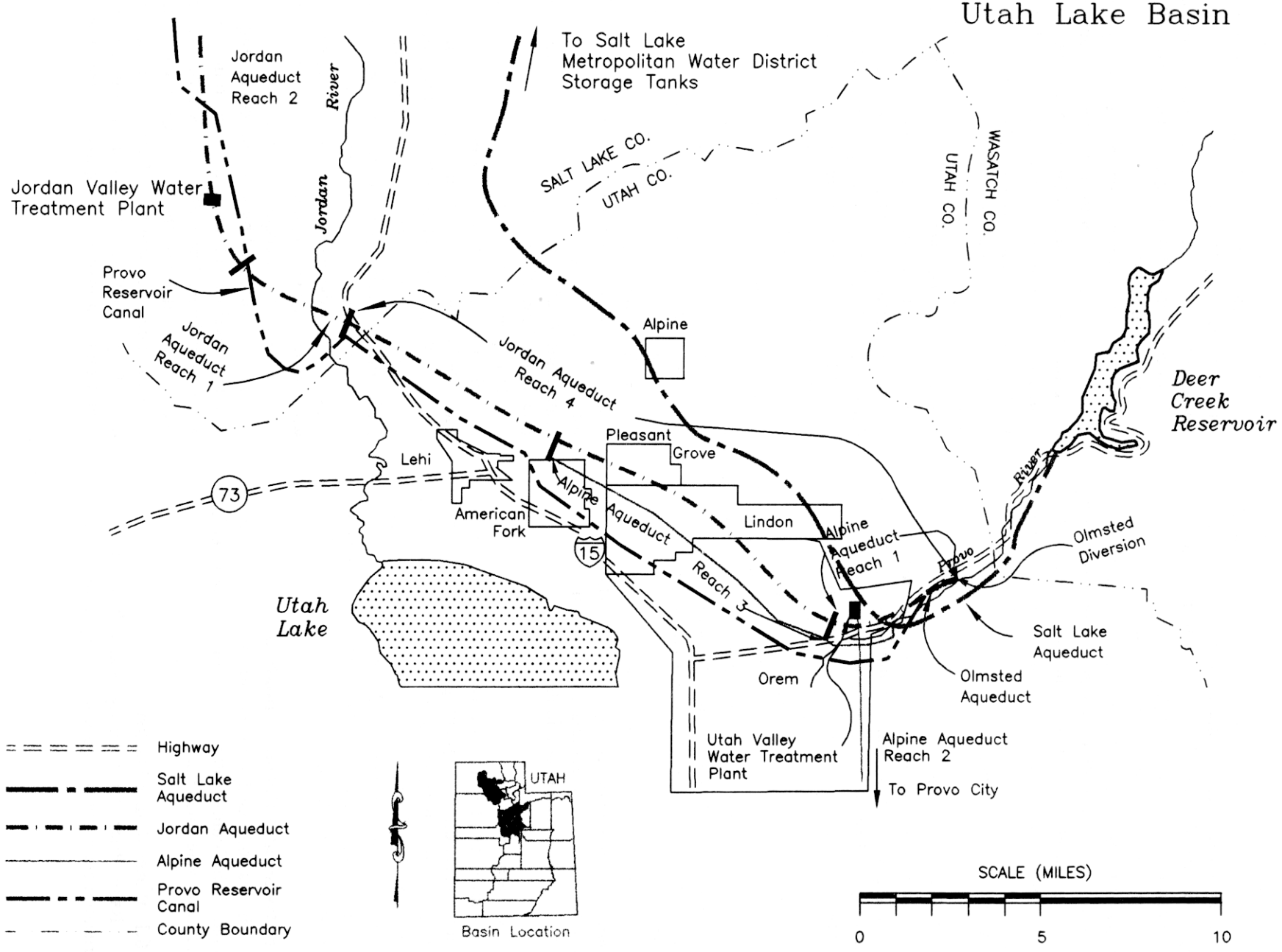
9.5.3 Groundwater Recharge and Management

The potential for artificial recharge of groundwater along the Wasatch Front was studied by the State Engineer in 1978. A groundwater recharge demonstration project has recently been completed by the Salt Lake County Water Conservancy District. The demonstration project is located in southeast Salt Lake County. The lessons learned, and technology acquired, may be applied to groundwater management in the Utah Lake drainage area.

Groundwater could be used more efficiently in some instances by managing it in conjunction with winter surface water flows. Although summer flows are appropriated for irrigation, winter season treatment is a possibility in some cases. These winter flows could also be treated in new treatment plants and used directly in place of groundwater pumpage by local cities. Opportunities may exist to do this with water from American Fork River and Spanish Fork River in Utah County and Snake Creek in Wasatch County. The

Figure 9–1

MAJOR AQUEDUCTS
Utah Lake Basin



possibility exists during winter months to leave water in those unlined irrigation canals which are located in natural recharge zones. Flood detention basins are located at the mouths of several creeks which could be used during the non-irrigation season for supplemental groundwater recharge. Some of these facilities are on highly permeable alluvial sand where recharge to the deep aquifer can be accomplished.

Surface water can be left in stream channels and exchanged from new wells. Provo City is currently constructing a new well to exchange water from Spring Creek, allowing it to flow to Utah Lake by exchange. Any groundwater recharge and management options chosen would have to account for possible effects on downstream storage rights.

9.5.4 Cloud Seeding

The Utah Cloud Seeding Program has the goal of increasing winter precipitation within targeted mountain watersheds. Enhanced winter snowpack leads to additional surface streamflow runoff and underground water storage during spring and summer months. Analyses made suggest this goal is being achieved.

Upper portions of the Provo River are in the target area of the Western Uinta Mountains Cloud Seeding Program. Evaluations indicate cloud seeding added 5-15 percent of precipitation each year over the past five years.

Eastern Juab County is on the northern tip of the Southern Utah Cloud Seeding Program. This area has been seeded for 17 years and adds between 5 and 15 percent to the precipitation in the area.

9.5.5 Conservation

Numerous programs are available for promoting water conservation. These programs include, but are not limited to, rebates to water users for reducing their lawn sizes, low-flow shower heads, secondary irrigation systems, wastewater reuse, and conservation-inducing price structures. These and other programs are explored in detail in Section 17.

9.6 Issues and Recommendations

Issues addressed are the dramatic increase in prices in the Utah County water market, improving Utah Lake, and local water planning.

9.6.1 Water Rights Markets

Issue: Prices for water rights and shares of irrigation company stock are increasing dramatically due to population growth requirements imposed on new development and restrictions on moving water between prior use and where it is needed.

Discussion - Most of the cities in Utah Valley have passed ordinances requiring developers to provide rights for water needed to serve their new subdivisions. This has set off a flurry of activity in the local water market and prices for irrigation company shares and well rights have spurted upward.

These local ordinances create a temporary shortage in the local water market for irrigation company shares and groundwater rights. In theory, prices increase until local share and well owners are induced to sell enough water to balance supply with demand. With the price at an all-time high, irrigators have an incentive to sell their water with the land or let the land sit unused. The consequence is that water and land once employed for crop irrigation is moving to municipal uses.

In the meantime, the Central Utah Water Conservancy District is finishing the Central Utah Project (CUP). The CUP water is coming on line at the same time developers are scurrying to find water to turn over to cities. The CUP water, however, is not available for private developers to purchase. Cities have less need for CUP supplies because water provided by developers comes at no cost. Therefore, high prices for irrigation shares and groundwater rights are drawing water from agriculture to municipal use at the same time CUP is developing municipal water supplies to meet future growth. Rising prices have also made it difficult for the Central Utah Water Conservancy District to acquire the 75 cfs required by the CUPCA for instream flow in the Lower Provo River.

Data presented in Table 9-2 and in Section 11 show that with the CUP completed, water supplies will be adequate in most areas of Utah Valley well into the next century. While some cities will have difficulty meeting future demand there is no general water shortage to justify the high prices that are currently being paid. New home buyers are paying higher prices, and are the ones who bear the cost of high prices being paid for water rights. Cities and other water providers benefit because their cost of acquiring water is less.

The price charged by a city for committing water to a new development should be equal to the cost of water from the next best alternative source. The price charged by a city in southern Utah County may be the capitalized cost per acre-foot of water to be delivered by the SFN system of the CUP. For cities in northern Utah County, it may be the capitalized cost of water

from Alpine Aqueduct Reaches II and III. This policy would send the price signal on what future water supplies will cost. Developers and annexes, along with city officials, would be required to make decisions based on the cost of the next increment of water supply. Meanwhile, the cities would be building a reserve fund with which to pay for construction and other costs of bringing in the future supply.

Recommendation - Local government officials should assess the long-term effects of requiring developers to donate water for new development. New water demand should be served with water acquired from CUP through conservation and by interlocal agreements with nearby systems.

9.6.2 Utah Lake Improvement

Issue - Utah Lake is perceived by many to have great potential for economical development of municipal water supply, recreation, transportation, fish and wildlife management, real estate, and other uses.

Discussion - On two occasions, task forces have been created to study issues surrounding development of Utah Lake and make recommendations for legislative or other action. At present, no progress has been made. In 1989, the Utah Legislature considered S.B. 77, the Utah Lake Authority Act. It would provide for a Utah Lake Authority and governing board to establish and coordinate programs for development of Utah Lake. Disagreement over the distribution of power on the authority board prevented the act from being passed.

A recommendation from the most recent Utah Lake Task Force was to create a Utah Lake Commission/ Coordinating Council. This organization would have the power to coordinate all aspects of Utah Lake development, maintenance and management. A full time director and staff were recommended.

The objectives of Utah Lake improvement must be to increase the efficiency of the lake for water storage, enhance the quality of lake water, and gain control of its fluctuating surface while protecting wildlife values and established water rights. Several schemes have been discussed for doing this, but none has gained widespread approval. An obstacle to improving Utah Lake is the lack of solid proposals for large-scale development projects that demand the attention of public officials. Since the 1987 Supreme Court ruling, the Division of Forestry, Fire and State Lands has not received applications for any of the various development proposals. Yet rumors abound of developers who would like to invest in Utah Lake development.

A management plan would help develop the potential of Utah Lake. It should address the role of the county and cities in zoning for the orderly development of uplands and in coordinating the permitting process for development of the lake bed. A technical task force could be formed to explore ways to increase control of the lake's surface elevation. A coordinating council, made up of representatives from water right holders and from state and federal agencies having lake-related missions, would set broad policies to coordinate and expedite permitting on Utah Lake consistent with the plan.

Recommendation - Utah County should take the lead in establishing an interagency entity to oversee the preparation of a management plan for Utah Lake.

9.6.3 Local Water Planning

Issue - Many communities are not adequately planning for future growth.

Discussion - Water purveyors need to plan their future growth. Water conservation will should be an integral part of each agency's water management plan. The present advice from water planners throughout the U.S. is to estimate a community's growth for the next 50 years. Community leaders can plan a combination of water supply, water quality and conservation strategies that will provide an integrated structural and non-structural program to meet their needs.

Various scenarios can be employed, considering all options available to communities. Least-cost analysis may be used, with water conservation and environmental impacts given full consideration. Groundwater sources, converting agricultural water and reducing water demand should be considered for inside and outside a community's homes.

The plan can be reappraised periodically. By updating population projections, re-evaluating water source quality and capacities, and incorporating newly-developed conservation methods, individuals responsible for water delivery can be alerted to problems beyond their term of office that require timely action for the future quality of life.

Recommendation - All communities and/or water utilities should prepare a long-term water management plan which includes new water supply sources and water conservation programs. The plans should be reviewed and updated periodically. To encourage management and conservation planning, water funding agencies should require plans as a condition of state participation in the projects. ✣ ✣